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| 09/446,641 | 12/22/1999 | TSUYONOBU HATAZAWA | P99.2641 | 2680 |

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EXAMINER

DOVE, TRACY MAE

| ART UNIT | PAPER NUMBER |
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1745

DATE MAILED: 01/21/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

09/446,641

Applicant(s)

HATAZAWA ET AL.

Examiner

Tracy Dove

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --
Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 20 December 2004.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 10,13-17,22-26 and 29 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 10,13-17,22-26 and 29 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☒ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date _____.
- 4) ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____.
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: _____.

DETAILED ACTION

This Office Action is in response to the communication filed on 12/20/04. Applicant's arguments of 11/15/04 have been considered, but are not persuasive. Claims 10, 13-17, 22-26 and 29 are pending.

Continued Examination Under 37 CFR 1.114

A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on 12/20/04 has been entered.

Claim Rejections - 35 USC § 112

The rejection of claims 20, 21, 27 and 28 under 35 U.S.C. 112, first paragraph, is withdrawn. The rejection of claims 13, 20, 21, 27 and 28 under 35 U.S.C. 112, second paragraph, is withdrawn. Claims 20, 21, 27 and 28 have been canceled.

Claims Analysis

Note the specification states the plasticizer or solvent may comprise an ester, ether or carbonate and the solvent is removed to solidify the electrolyte (page 8, lines 5-9 and page 11, lines 19-21). Thus, a plasticizer is interpreted as any ester, ether or carbonate compound. Thus, a solvent is interpreted as any ester, ether or carbonate compound.

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

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A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

Claims 22, 25 and 26 are rejected under 35 U.S.C. 102(b) as being anticipated by

Yasugata, JP 08-236095.

Yasugata teaches a lithium battery comprising a separator (solid electrolyte) located between a positive electrode and a negative electrode. The separator comprises polyvinylidene fluoride (fluorocarbon polymer) having a weight average molecular weight of 50,000-2,000,000, preferably 100,000 to 1,000,000. An electrolytic solution impregnates the separator and electrodes (0001, 0003 and 0006-0007).

Thus the claims are anticipated.

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Claims 10, 13-17, 22-26 and 29 are rejected under 35 U.S.C. 102(e) as being anticipated by Gao et al., US 5,756,230.

Gao teaches a method of improving the structural integrity of an electrode binder and a polymeric matrix component of an electrochemical cell by employing polymer blends comprising fluoropolymers. See abstract. With the inventive fluoropolymer blends of Gao, the polymer binders of the anode and cathode and the polymeric layer of the electrolyte (solid) do not become brittle and crack under stress. See col. 2, lines 1-38. The fluoropolymer blends are described in col. 4, lines 19-67. *The individual polymers of the blend* may be homopolymers having a molecular weight in the range of 50,000 to 900,000, copolymers having a molecular

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weight in the range of 10,000 to 900,000 or terpolymers having a molecular weight in the range of 10,000 to 900,000. Note polytetrafluoroethylene and polyvinyl fluorides are preferred homopolymers and polyvinylidene fluoride-hexafluoropropylene is a preferred copolymer. For blends comprising a homopolymer and a copolymer, the relative weight percentage of the homopolymer preferably ranges from about 90% to 50%. See col. 5, lines 5-23. Gao teaches placing an electrolyte solution comprising an electrolyte solvent and a salt into said anode, cathode and polymeric compositions (col. 2, lines 9-23) (impregnates a face of the positive and negative electrodes). The cathode may comprise a lithium transition metal oxide and the anode may comprise carbon (col. 5, lines 59-65). Lithium ion cells are rechargeable. Lamination causes the polymeric components of the anode and cathode precursors to adhere to the polymeric layer (Example 3). The electrochemical cell includes an electrolytic solvent such as an organic carbonate (col. 5, lines 36-67). Typical solvents include propylene carbonate and ethylene carbonate (plasticizer of instant invention, see page 17, lines 1-9 of specification). The polymeric matrix is mixed with dibutyl phthalate (ester) and the polymeric layer is formed such that the electrolyte solution (salt and solvent) fills the pores created by the extraction of the dibutyl phthalate (ester solvent of the instant invention). See col. 10, lines 28-48.

Gao teaches a fluoropolymer blend of a homopolymer having a typical molecular weight in the range of 50,000 to 900,000 and a copolymer having a typical molecular weight in the range of 10,000 to 900,000. Gao further teaches a polymer blend of a homopolymer having a typical molecular weight in the range of 50,000 to 900,000 and a terpolymer having a typical molecular weight in the range of 10,000 to 900,000. See col. 4, lines 44-65 and col. 5, lines 6-

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23). Gao teaches preferably the polymers forming the fluoropolymer blend have a high average molecular weight.

Thus the claims are anticipated.

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Claims 10, 13-17, 22-26 and 29 are rejected under 35 U.S.C. 102(b) as being anticipated by Humphrey et al., EP 0730316.

Humphrey teaches an electrochemical cell having a positive electrode, an absorber-separator sometimes referred to as a solid electrolyte, and a negative electrode. At least one of the electrodes or the separator comprises a porous polyvinylidene fluoride (PVDF), the PVDF electrodes having an electrode material combined therewith and the PVDF separator having an electrolyte material combined therewith (4:13-18). The PVDF polymer may include either a homopolymer or a copolymer, wherein the copolymers are either heterogeneous or homogeneous copolymers of vinylidene fluoride and hexafluoropropylene. The co-monomer is present from about 7 to about 25 wt%. The use of homogeneous copolymers for the manufacture of the electrode and electrolyte matrices is especially preferred (4:32-39). Polymers that may be used are shown in Table III. The table shows various grades of KYNARTM (tradename for PVDF and are commercially available) ranging in weight average molecular weights of 33,500 to 572,500. KYNARTM 460 (572,000) and KYNARTM 460 Black (373,500) are included in Table III. Table IV also describes the combination of medium and high molecular weight grades to provide a PVDF homopolymer. The positive electrode includes LiMn₂O₄ and the negative electrode includes petroleum coke (carbonaceous material) (13:42-48). The negative electrode material may be graphite (14:16-19). Thus the claims are anticipated.

Response to Arguments

Applicant's arguments filed 11/15/04 have been fully considered but they are not persuasive.

YASUGATA

Applicant argues Yasugata relates to a separator molded by adding polyvinylidene fluoride to polyethylene, and not formed by adopting a solid electrolyte like the present invention. It is unclear how Applicant reaches this conclusion regarding the teachings of Yasugata. Claim 22 recites a “solid electrolyte *comprising* a first fluorocarbon polymer”, and hence does not exclude polyethylene as a material of the solid electrolyte. Furthermore, the solid electrolyte of the claimed invention separates the positive and negative electrodes. Therefore, the solid electrolyte of the claimed invention is a separator. Applicant has not provided any persuasive arguments in support of the conclusion that Yasugata does not anticipate the claimed invention. Thus the 35 U.S.C. 102(b) rejection is maintained.

GAO

Applicant argues while Gao teaches polyvinyl fluoride or polyhexafluoropropylene, Gao does not teach using a polyvinylidene fluoride as recited in claims 13 and 29. Examiner disagrees with Applicant's analysis of the Gao reference. Gao teaches polyvinylidene difluoride-hexafluoropropylene is a preferred copolymer (4:44-65). Examiner has provided a NIST printout that discloses vinylidene difluoride and vinylidene fluoride are different names for the same chemical compound. Since claims 13 and 29 recite polyvinylidene fluoride/hexafluoropropylene copolymer, the claims are anticipated by Gao. The weight average molecular weight ranges of the prior art for the first and second fluorocarbon polymer overlap

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the molecular weight ranges of the prior art for the fluoropolymer blends of Gao. Furthermore, at least claim 22 does not require a first and a second fluorocarbon polymer. Thus, Gao anticipates the claimed invention.

HUMPHREY

Applicant argues KYNAR 460 is a homopolymer of polyvinylidene fluoride and it is not clear where the two peaks exist. However, Humphrey teaches the solid electrolyte may be a polymer including polyvinylidene fluoride. Polymers that may be used are shown in Table III. Table IV describes the combination of medium and high molecular weight grades to provide a PVDF polymer. KYNARTM 460 with a molecular weight of 572,000 is the first fluorocarbon polymer and KYNARTM 460 Black with a molecular weight of 373,500 is the second fluorocarbon polymer of the claimed invention. Thus, Applicant's arguments are not convincing.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Tracy Dove whose telephone number is 571-272-1285. The examiner can normally be reached on Monday-Thursday (9:00-7:30).

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Pat Ryan can be reached on 571-272-1292. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

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Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

A handwritten signature in black ink, appearing to read 'Tracy Dove', with a long, sweeping horizontal stroke extending to the left.

Tracy Dove
Patent Examiner
Technology Center 1700
Art Unit 1745

January 17, 2005